IN THE DRAWINGS

The attached sheet of drawings includes changes to Fig. 57B. This sheet, which includes Fig. 57B, replaces the original sheet including Fig. 57B.

Attachment: Replacement Sheet

REMARKS/ARGUMENTS

Favorable reconsideration of this application in light of the following discussion is respectfully requested.

Claims 5-8 and 11-15 and 22-23 are presently active in this case; Claims 5, 6, 8, 11, 12 and 14 having been amended; and Claims 22-23 added and Claim 16 canceled by way of the present amendment.

In the outstanding Office Action, the specification and drawings were objected to; Claims 5, 22 and 23 were objected to for minor informalities and Claims 13 and 15 were objected to as being a substantial repeat of Claims 22 and 23; Claims 5, 7, 8, 11, 12 and 14 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Goebel et al. (U.S. Patent 6,172,391 B1, hereinafter Goebel) in view of Alsmeier et al. (U.S. Patent 6,201,730 B1, hereinafter Alsmeier) and Gruening et al. (U.S. Patent 6,093,614, hereinafter Gruening); Claims 22 and 23 were allowed and Claims 13, 15 and 16 were indicated as allowable if re-written in independent form.

First, Applicants wish to thank Examiner Mondt for the indication of allowable subject matter in Claims 13, 15, and 16, and allowance of Claims 22 and 23. In order to expedite issuance of a patent in this case, Applicants have amended independent Claim 5 to include the allowable subject matter of Claim 16. Therefore, Claim 5, and Claims 6-8 and 11-15 depending from Claim 5 are in condition for allowance. Further, the amendment to Claim 5 makes this claim distinguishable from Claim 22, and makes Claim 15 distinguishable from Claim 23. Therefore, the objection to Claims 22 and 23 as being duplicative is also overcome by way of the present amendment. Therefore, all pending claims patentably define over the cited references in this case.

Turning to the objection to the drawings, the outstanding Official Action takes the position that the connection line recited in Claim 1 cannot be reference number 128 because

item 128 is connected to the first impurity layer and not the "second impurity layer formed at the bottom of the trench."[1] However, as seen in Figure 34 of the present specification, the first impurity layer 109' is formed at the top of silicon column 106, and the second impurity layer 109 is formed at the bottom of the trench close to a plane of the p-type impurity region 117. As shown in Figures 39-41, the polysilicon 128 is formed in contact with the impurity layer 109 formed at the bottom of the trench (note that these views do not show the impurity layer 109', which is at a different cross-sectional plane). Thus, the polysilicon layer 128 in Figures 39-40 provides support for the recited "connection line configured to bring the second impurity layer...out to the major surface of the silicon substrate," as recited in Claim 5.

The Office Action takes the position that the specification and drawings fail to disclose the second impurity layer united with respect to adjacent three or more of the silicon columns on the bottom of the trench as recited in Claim 15. In particular, the Office Action notes that the items 201 and 202 shown in Figure 56, which describes an embodiment of the invention covered by Claim 15, are not mentioned in Figures 45a and 45b. Applicants note, however, that item 201 in Figure 56 is described in the specification as a silicon column, which clearly relates to item 106 in Figures 45a-46b. Further, item 202 in Figure 56 is described in the specification as the "trench bottom," which clearly relates to the "n^+ region (at bottom)" referred to in Figure 46b. Thus, as shown in Figure 56, the second impurity region 202 is a united structure that joins three or more of the silicon columns 201. Thus, Figure 56, when viewed in relation to Figures 45a-46b, provides support for Claim 15.

Finally, the Office Action also takes the position that Figure 57 and the text relating thereto does not provide support for "a plurality of silicon columns form an array of a matrix form and one pair of silicon columns at both corners on a diagonal line of the matrix form are

1 See Official Action at page 9, paragraph 3A.

lacking" as originally recited in Claim 16 and now included in Claim 5. However, Figure 57b and the text relating thereto, describe a diagonal line that extends between the x notations in Figure 57b. Applicants have now amended Figure 57b in order to depict this diagonal line by use of a dashed line. Therefore the objection to Claim 16 is also overcome.

By way of the arguments and amendments presented herein, Applicants submit that the present application is in condition for allowance. An early and favorable action is therefore respectfully requested.

Respectfully submitted,

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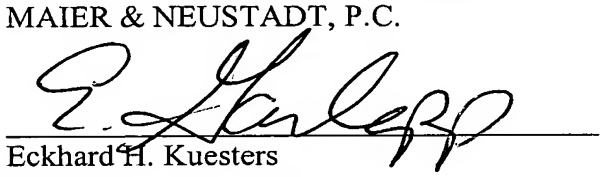

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